porterbrook

Class 143 & 144 Diesel Multiple Units

porterbrook

Porterbrook Leasing Company Limited
Ivatt House, 7 The Point, Pinnacle Way,
Pride Park, Derby, DE24 8ZS

T +44 (0) 1332 285050
F +44 (0) 1332 285051

enquiries@porterbrook.co.uk
http://www.porterbrook.co.uk

Issue 01 Revision A
September 2012

Contents

Passenger Satisfaction 4
Refurbishment and Modernisation 9
Passengers of Reduced Mobility Provision 10
Passenger Information System 12
Engineering 14
Technical Information 16
143 Data Sheets 17
144 Data Sheets 22

Passenger Satisfaction

The Class 143 and 144 DMUs are the most economical rolling stock for providing a rail service in the UK.

The units light weight (24 tons) and 165 kW engine gives them a good acceleration ideal for short distance commuter services. Although developed from automotive principles the interiors now provide a more rail-based environment.

Although a pacer vehicle is 5.5m shorter than a 150/2 this is partly compensated for by using only 3 doors per vehicle, while passenger perception is improved by the use of narrow window pillars and a single, open saloon.

Class 143 and 144 units are generally held to be better than earlier designs with the Walter Alexander body providing a neat appearance. The 4-wheel arrangement has performance advantages as it provides 50% powered axles and 50% of vehicle mass available for traction giving low speed torque which many electric Multiple Units cannot match.

Ten Class 144 units had powered centre cars added to increase capacity. These units are used on commuter services into Leeds where they have seen many years of successful operation under high-utilisation conditions. The whole Class 144 fleet is currently in use in Yorkshire; however the growth in ridership across the Northern franchise is driving more electrification which should allow some Class 144 units to be redeployed. They operate in multiple with all Class 14X and 15X units and so they are ideal for service strengthening with these units.

The acceleration rates and boarding times are similar to Class 150/2 hence no timetable risk is associated with their introduction on services worked by these units.

Class 143 and 144 units are equally effective on rural services and major city commuter operations and provide an excellent capacity boost at minimum cost. Since many components, including the cab equipment, are similar to Class 15X units costs for driver training, maintenance and material holdings are minimized compared to introducing other classes or new vehicles.

Ventilation is from opening “hopper” windows, this being adequate for the sort of frequent-stop services they are normally employed on. Seats are the widely used Chapman SC1X type with an integral grab handle.

Knottingley
144023

Refurbishment and Modernisation

The Class 14X vehicles have seen a range of refurbishments since their introduction, although the layout has remained much the same with uni-directional seats all facing a bay in the centre of the vehicle.

The emphasis on this type of vehicle is always on keeping the cost down but a lot can be achieved with the relatively simple use of coatings and lighting..

The simple construction of the vehicles means that the exterior shell presents no problems for continued service operation. The steel framework is well protected and easily repaired in the event of damage or water ingress. The exterior panels are aluminium sheets riveted to this framework, hence these do not suffer the corrosion problems associated with the steel panels used on the Leyland bus based designs. A programme of rivet replacement has been undertaken at the last repair.

Passengers of Reduced Mobility (PRM) Provision

The vehicles require modifications to the layout for operation in 2020 and beyond as the toilet is not accessible from the wheelchair spaces. The expected modifications are: -

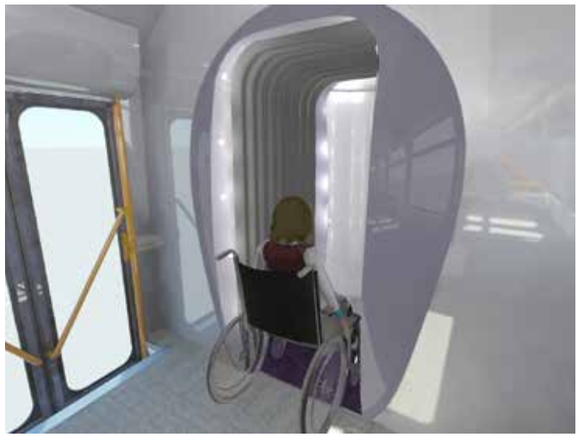
- Seat back handles – New design required with wider grip
- Priority seats – some fitted at refurbishing but more required
- Second wheelchair space required (both spaces to be near toilet)
- Call for aid buttons to be fitted in toilet and wheelchair spaces
- Door sounders – required in all external door control panels
- Universal Toilet to be fitted (assuming service requires the facility)
- Passenger Information System to be fitted

If the vehicles are to operate a service where a toilet is not required the scope of modifications can be reduced considerably.

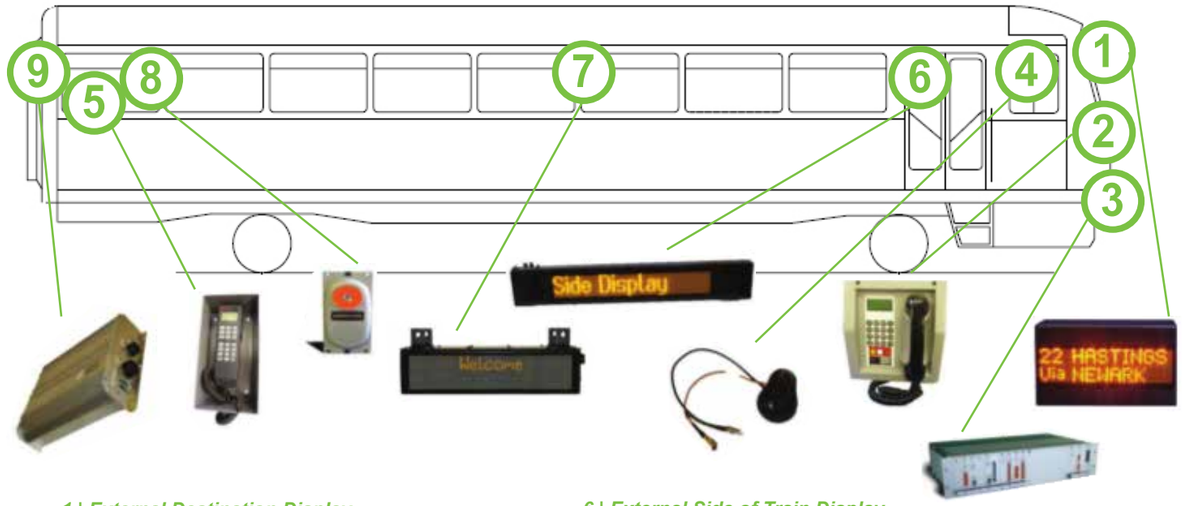
It is an obvious concern that providing these facilities would result in an unacceptable loss of seating however an innovative proposal has been made to optimise the interior layout for the new facilities. It is proposed to fit a new gangway which will be suitable for wheelchair use, opening out the inner-end of the vehicle and providing a common circulating area between the two doors. This arrangement means the toilet can remain in the same place with wheelchair spaces in the adjacent vehicle and exterior doors accessible on both sides.

Another significant modification is the fitting of a Passenger Information System, this being a benefit to disabled and able-bodied people alike. A system will be fitted to maintain compatibility with Class 15X units, with enhanced functionality available if required.

The other modifications required are routine items applied to many vehicles as the programme for 2020 compliance continues.



Passenger Information System



1 | External Destination Display

Installed in each driving vehicle. PRM TSI compliant Yellow LED Ultra Bright sunlight legible with automatic brightness control in single or multi-line.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

2 | Drivers Interface Unit (DIU)

Installed in each driving vehicle. Provides the driver interface for PA, Cab to Cab, Passenger Alarms, Radio Systems and controls for the Passenger Information System. Layout and size manufactured to any particular requirements, although many proven existing designs are available from our portfolio.

3 | Passenger Information System Controller

Installed in each driving vehicle. Communicates via standard train wires or Ethernet network to all PIS equipment throughout the train. Route Database files are uploaded to this unit via a GPRS communications link for automatic broadcast of journey related announcements. Can be supplied 19 inch rack based (half Euro height) or as a sealed bulk head mounting unit.

4 | Dual Antenna

Installed on the roof of each driving vehicle. A low profile dual antenna (GPS and GPRS) enables geographic tracking and data upload/download.

5 | Stewards Handset

Provides PA, Cab to Cab and triggering of recorded messages. Installed at the Stewards Point in each car.

6 | External Side of Train Display

Installed adjacent to each door. Outward facing, side of train display. PRM TSI compliant Yellow LED Ultra Bright sunlight legible with automatic brightness control in single or multi-line.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

7 | Internal Saloon Display

PRM TSI compliant, supplied as single or double sided, these displays are suspended centrally or mounted on the bulk head walls in the saloon vehicles. Standard brightness in single colour or multi-colour LED formats. Single or multi-line, high or low resolution.

LED Matrix size can be manufactured to any particular requirements, although many proven existing designs are available from our portfolio. Displayed messages may be static or scrolling.

8 | Passenger Emergency Alarm Communications Unit (PEACU)

Provides emergency speech and emergency brake functions. Includes a loudspeaker/microphone and large red button (latching or non latching) and indicates to the passenger when to speak to the driver. Suitable for installation adjacent to doors, disabled seating locations and within toilet modules.

9 | Saloon Audio Control Unit (SACU)

Installed in each vehicle, this is the PA amplifier and interface to all saloon equipment including loudspeakers, Displays, Passenger Alarms and Stewards Handsets.

Passenger information systems are a requirement for PRM TSI compliance but are also invaluable for any occasional traveller. The system proposed will be compatible with other units allowing the Class 14X-15X inter-working capability to be retained. Enhancements are possible to the system to meet further information requirements and exact display configuration is flexible to customer preference.

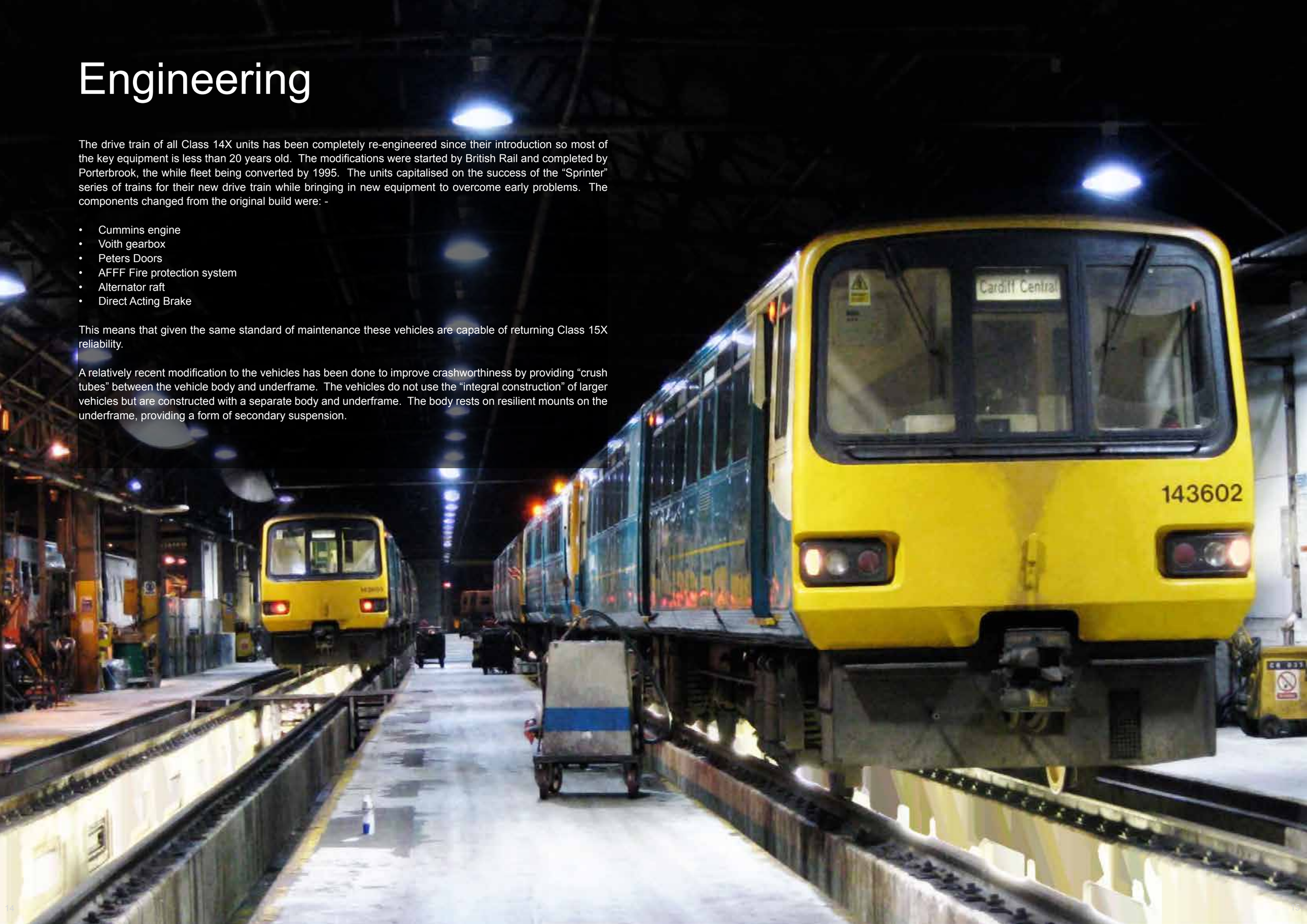
Engineering

The drive train of all Class 14X units has been completely re-engineered since their introduction so most of the key equipment is less than 20 years old. The modifications were started by British Rail and completed by Porterbrook, the while fleet being converted by 1995. The units capitalised on the success of the “Sprinter” series of trains for their new drive train while bringing in new equipment to overcome early problems. The components changed from the original build were: -

- Cummins engine
- Voith gearbox
- Peters Doors
- AFFF Fire protection system
- Alternator raft
- Direct Acting Brake

This means that given the same standard of maintenance these vehicles are capable of returning Class 15X reliability.

A relatively recent modification to the vehicles has been done to improve crashworthiness by providing “crush tubes” between the vehicle body and underframe. The vehicles do not use the “integral construction” of larger vehicles but are constructed with a separate body and underframe. The body rests on resilient mounts on the underframe, providing a form of secondary suspension.

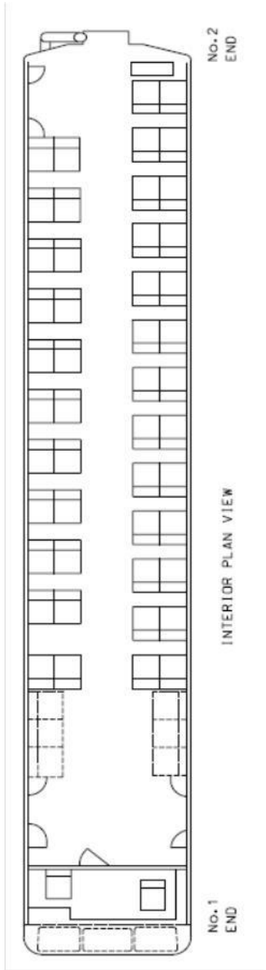
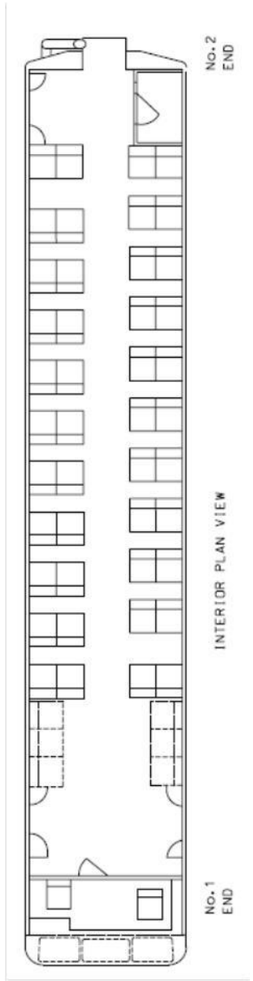


Technical Information

143 Data Sheets

Basic information

	DMS	DMSL
Class	143 Pacer	
Sub class	-	
Manufacturer	BREL-DERBY/Leyland	
Number of vehicles	16	16
Route availability	RA1	
Power	DMU- Diesel Engine on each vehicle/unit Engine: Cummins LTA 10-R, 230 hp at 2100 rpm Voith T211r hydraulic and SCG RF420i final drive transmission	
Hardware		
Length	15.55m	
Width	2.70m	
Height	3.73m	
Gauge	Standard UK rail gauge (1435mm)	
Axle load	12.25t tare	12.485t tare
Coupling compatibility	BSI Bar Couplers. Compatible with 14x, 15x and 170 vehicles	
Performance		
Maximum Speed	75mph	
Acceleration	Unknown	
Braking Capability	Unknown	
Braking System	Tread Brakes	
Other features		
e.g. In-cab radio system, CCTV, other passenger-enhancing facilities.	GSMR and NRN radio, Mac Air cab air conditioning, Arrowvale OTMR	

	DMS		DMSL	
Day to day operation				
Door configuration	3 doors per vehicle. Twin–leaf inward pivoting (based on a bus door)			
Seating Configuration	2+2 high backing, mainly unidirectional			
No. of seats	48 (+6 tip up)		44 (+6 tip up)	
Floor space for standing	42.8m^2	44.7m^2	41.3m^2	42.4m^2
Toilets	0		1	
Layout Diagram				

Build dates

Unit	DMS	DMSL	Year of Manufacture	Previous numbers (if changed)
143602	55651	55668	1985	
143603	55658	55669	1985	
143604	55645	55670	1985	
143605	55646	55671	1985	
143606	55647	55672	1985	
143607	55648	55673	1985	
143608	55649	55674	1985	
143611	55652	55677	1985	
143612	55653	55678	1985	
143616	55657	55682	1985	
143620	55661	55686	1986	
143621	55662	55687	1986	
143622	55663	55688	1986	
143623	55664	55689	1986	
143624	55665	55690	1986	
143625	55666	55691	1986	

Heavy Maintenance

Activity	Commencement	Duration	Nature of activity	Responsible party
C4	350,000 miles +25,000/-0 over lease duration		See PB/VI1444 Issue 2	Lessee
C6	7-8 years over lease duration		See PB/VI1436 Issue 2	Lessee
Paint	7-8 years over lease duration		Repaint	Lessee
Engine overhaul	390,000 miles +/-10,000 over lease duration		See PB/TP1249 Issue 1	Lessee
Gearbox overhaul	490,000 miles +/-10,000 over lease duration			Lessee
Wheelset	175,000 miles +/-75,000 over lease duration			Lessee

Modifications

Modification	Duration	Nature of activity	Responsible party
Base Offer			
Oil carryover optimisation and standardisation		Reduced maintenance costs	Porterbrook
Air system review		Consideration to vehicle air system pipe work / vessels for CSO	Porterbrook
Emergency brake pushbutton		Safety feature as fitted to modern rolling stock	Porterbrook
LT10 engine improvements and obsolescence risk		Reduce obsolescence risk and improved reliabity	Porterbrook
Fire system review		Modernisation of fire system to improve vehicle reliability, reduce obsolescence risk and reduce maintenance costs	Porterbrook
New aux heater		Obsolescence	Porterbrook
Develop electrical system overhaul and activation of ELCB		Reliability and safety	Porterbrook
TDS doors mods and ongoing health/checks & maintenance		Modifications as per ATW fleet to enhance reliability	Porterbrook
TDS doors mods and ongoing health/checks & maintenance		Modifications as per ATW fleet to enhance reliability	Porterbrook
Enhanced Offer			
Full PRM-TSI compliance		The vehicles will be modified to comply with the PRM TSI legislation which will include seat back handles, additional wheelchair space/call for aid button, door sounders, and boarding ramp fixing points. The toilet will need replacement for full PRM-TSI compliance.	Porterbrook
New interiors		To include seat, carpet, tables, dado, end panels, ceilings, vestibules etc upgrade.	Porterbrook
Engine Centrifugal oil filtration		Reduced maintenance and enhanced reliability	Porterbrook

Modification	Duration	Nature of activity	Responsible party
Voith Cardan Shaft		1,000,000 miles cardan shafts	Porterbrook
Fuel Saving initiatives		Reduced operating costs	Porterbrook
Remote door monitoring		Reduced maintenance cost and improved reliability	Porterbrook
LED lighting		Reduced energy consumption and maintenance benefits	Porterbrook

Information not supplied

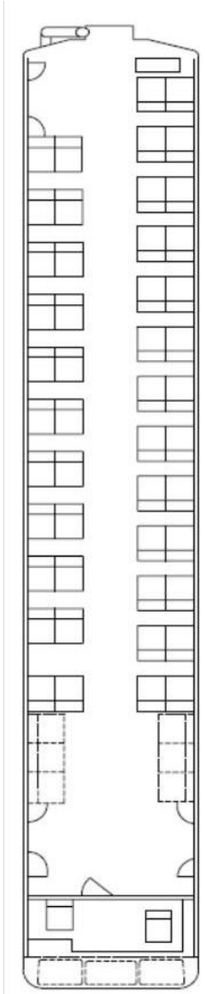
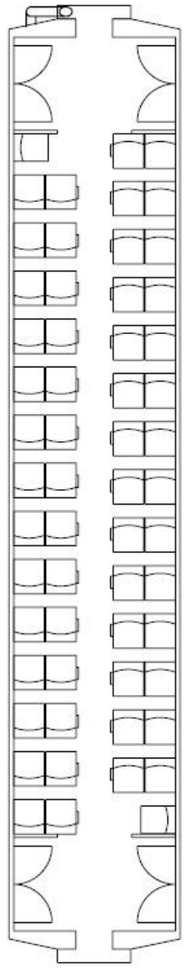
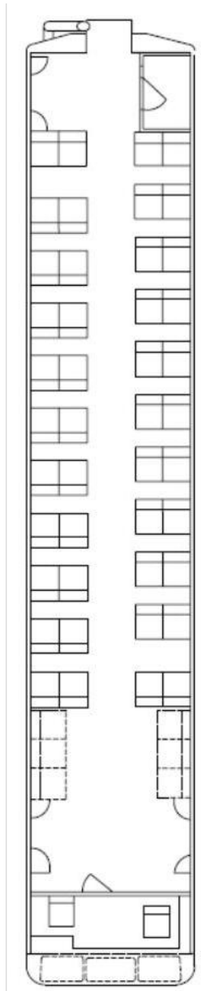
Any information not supplied because of a lack of availability must be listed here under the 'reasonable endeavour' clause of the competition commission's ruling.

- Max. acceleration
- Braking performance
- Modification commencement dates
- Modification durations

144 Data Sheets

Basic information

	DMS	MS	DMSL
Class	144 Pacer		
Sub class	-		
Manufacturer	BREL-DERBY/Alexander		
Number of vehicles	23	10	23
Route availability	RA1		
Power	DMU- Diesel Engine on each vehicle Engine: Cummins LTA 10-R, 230 hp at 2100 rpm Voith T211r hydraulic and SCG RF420i final drive transmission		
Hardware			
Length	15.55m	15.43m	15.55m
Width	2.70m		
Height	3.73m		
Gauge	Standard UK rail gauge (1435mm)		
Axle load	12.25t tare	11.75t tare	12.485t tare
Coupling compatibility	BSI Bar Couplers. Compatible with 14x, 15x and 170 vehicles		
Performance			
Maximum Speed	75mph		
Acceleration	Unknown		
Braking Capability	Unknown		
Braking System	Tread Brakes		
Other features			
e.g. In-cab radio system, CCTV, other passenger-enhancing facilities.	GSMR and NRN radio, Arrowvale OTMR		

	DMS		DMSL
	Day to day operation		
Door configuration	3 doors per vehicle. Twin–leaf inward pivoting (based on a bus door)		
Seating Configuration	2+2 high backing, mainly unidirectional		
No. of seats	48 (+6 tip up)	58	44 (+6 tip up)
Floor space for standing	44.7m^2	48.1m^2	41.3m^2
Toilets	0	0	1
Layout Diagram			

Build dates

Unit	DMS	MS	DMSL	Year of Manufacture	Previous numbers (if changed)
144001	55801	-	55824	1986 - 87	
144002	55802	-	55825	1986 - 87	
144003	55803	-	55826	1986 - 87	
144004	55804	-	55827	1986 - 87	
144005	55805	-	55828	1986 - 87	
144006	55806	-	55829	1986 - 87	
144007	55807	-	55830	1986 - 87	
144008	55808	-	55831	1986 - 87	
144009	55809	-	55832	1986 - 87	
144010	55810	-	55833	1986 - 87	
144011	55811	-	55834	1986 - 87	
144012	55812	-	55835	1986 - 87	
144013	55813	-	55836	1986 - 87	
144014	55814	55850	55837	1986 - 87	MS added 1987
144015	55815	55851	55838	1986 - 87	MS added 1987
144016	55816	55852	55839	1986 - 87	MS added 1987
144017	55817	55853	55840	1986 - 87	MS added 1987
144018	55818	55854	55841	1986 - 87	MS added 1987
144019	55819	55855	55842	1986 - 87	MS added 1987
144020	55820	55856	55843	1986 - 87	MS added 1987
144021	55821	55857	55844	1986 - 87	MS added 1987
144022	55822	55858	55845	1986 - 87	MS added 1987
144023	55823	55859	55846	1986 - 87	MS added 1987

Heavy Maintenance

Activity	Commencement	Duration	Nature of activity	Responsible party
C4	350,000 miles +25,000/-0 over lease duration		See PB/VI1444 Issue 2	Lessee
C6	7-8 years over lease duration		See PB/VI1436 Issue 2	Lessee
Paint	7-8 years over lease duration		Repaint	Lessee
Engine overhaul	390,000 miles +/- 10,000 over lease duration		See PB/TP1249 Issue 1	Lessee
Gearbox overhaul	490,000 miles +/- 10,000 over lease duration			Lessee
Wheelset	175,000 miles +/- 75,000 over lease duration			Lessee

Modifications

Modification	Duration	Nature of activity	Responsible party
Base Offer			
Oil carryover optimisation and standardisation		Reduced maintenance costs	Porterbrook
Air system review		Consideration to vehicle air system pipe work / vessels for CSO	Porterbrook
Emergency brake pushbutton		Safety feature as fitted to modern rolling stock	Porterbrook
LT10 engine improvements and obsolescence risk		Reduce obsolescence risk and improved reliabity	Porterbrook
Fire system review		Modernisation of fire system to improve vehicle reliability, reduce obsolescence risk and reduce maintenance costs	Porterbrook
New aux heater		Obsolescence	Porterbrook
Develop electrical system overhaul and activation of ELCB		Reliability and safety	Porterbrook
TDS doors mods and ongoing health/checks & maintenance		Modifications as per ATW fleet to enhance reliability	Porterbrook
Enhanced Offer			
Full PRM-TSI compliance		The vehicles will be modified to comply with the PRM TSI legislation which will include seat back handles, additional wheelchair space/call for aid button, door sounders, and boarding ramp fixing points. The toilet will need replacement for full PRM-TSI compliance.	Porterbrook
New interiors		To include seat, floor covering, dado, end panels, ceilings, vestibules etc upgrade.	Porterbrook
Engine Centrifugal oil filtration		Reduced maintenance and enhanced reliability	Porterbrook
Voith Cardan Shaft		1,000,000 miles cardan shafts	Porterbrook
Fuel Saving initiatives		Reduced operating costs	Porterbrook

Modification	Duration	Nature of activity	Responsible party
Remote door monitoring		Reduced maintenance cost and improved reliability	Porterbrook
LED lighting		Reduced energy consumption and maintenance benefits	Porterbrook

Information not supplied

Any information not supplied because of a lack of availability must be listed here under the 'reasonable endeavour' clause of the competition commission's ruling.

- Max. acceleration
- Braking performance
- Modification commencement dates
- Modification durations

Class 144

Train Operator	Northern

Vehicle Qty	46
Consist	26 x 2-Car and 20 x 3-Car
Traction Type or Power Supply Type	One Cummins LTA 10-R of 173kW (230hp) @ 2100 rpm
Max Speed	75 mph

The newest and best of the “Pacer” railbus series, the Class 144 units are economical suburban units, built in 1986 - 1987. They have been extensively re-worked since build, receiving new engines, transmissions, brakes, doors, seats and fire systems. They now have Cummins L10 engines driving through a Voith transmission, recognised as the most dependable power train on any DMUs. The units are shorter than normal, being only 15.55 m long, and only have 3 doors per side. The space saved is used to accommodate a toilet in one vehicle and more seats in the other. The original 3 x 2 seating has been replaced by 2 x 2, offering greater comfort and reducing dwell times at busy times. Construction is of aluminium body panels on a steel underframe, a combination of bus and rail engineering. The units have no bogies, being based on a 4-wheel platform. Couplers are common with the Class 15X “sprinter” fleet, but would need a minor modification for Class 17X compatibility.

Navigation

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia

Interaction

Help
About Wikipedia
Community portal
Recent changes
Contact Wikipedia

Toolbox

What links here
Related changes
Upload file
Special pages
Permanent link
Cite this page

Print/export

Create a book
Download as PDF
Printable version

Languages

Polski
Simple English

British Rail Class 144

From Wikipedia, the free encyclopedia

This article **needs additional citations for verification**. Please help improve this article by adding citations to reliable sources. Unsourced material may be challenged and removed. *(February 2009)*

The British Rail **Class 144** "Pacer" diesel multiple units (DMUs) were built by BREL Derby from 1986 to 1987. A total of 23 units were built,[3] replacing many of the earlier first-generation "Heritage" DMUs.[*citation needed*]

Under the Disability Discrimination Act drawn up in the mid 1990s, all public transport will need to be accessible by 2019. Pacers are unable to meet this requirement so will have to be withdrawn by the end of 2019.[4]

British Rail Class 144 *Pacer*

Northern Rail/WYPTE Metro Class 144 Pacer No. 144001, recently reliveried, is seen at Sheffield

The interior of a Northern Rail/SYPTE Metro Class 144

In service	1986 - present
Manufacturer	BREL Derby and Walter Alexander
Family name	Pacer
Refurbishment	2002 - 2004 and 2010 Repaint 2008 - 2009 into Northern Rail livery
Number built	23 trainsets
Formation	DMS(+MS)+DMSL
Fleet numbers	144001 - 144023
Operator	Northern Rail
Line(s) served	Harrogate Line, Huddersfield Line, Hallam Line, Penistone Line, Pontefract Line, York & Selby Lines, Caldervale Line
Specifications	
Car body construction	Steel underframe. Aluminium alloy body and roof.
Maximum speed	75 mph (121 km/h)
Engine(s)	Cummins LTA10-R 6-cylinder 10-litre of 225 hp (168 kW) at 2100 rpm[1] (Originally fitted with Leyland TL11 6-cylinder 11.1-litre 205 hp (153 kW) at 1950 rpm)
Safety system (s)	AWS, TPWS
Coupling system	BSI[2]
Gauge	1,435 mm (4 ft 8 ½ in) Standard gauge

Contents [hide]

1 Description
2 Operations
3 Fleet details
4 Gallery
5 References

Description [edit]

At the beginning of the 1980s, British Rail (BR) had a large fleet of ageing "Heritage" DMUs, built to many different designs in the late 1950s and early 1960s.[*citation needed*] Some of the more reliable types were retained and refurbished. However, BR decided to replace many of the non-standard or unreliable types with new second generation units, built to modern standards. Two different types were pursued; low-cost "Pacers" built using bus parts and used on short-distance services;[*citation needed*] and "Sprinters" built for longer-distance services.[*citation needed*]

Twenty-three Class 144 units were built.[3] The units have a maximum speed of 75 mph (121 km/h) and are externally similar to the earlier Class 143 Pacers (they have a Walter Alexander body like the Class 143), built in 1985–1986. The first thirteen of the class, No. 144001-013 are 2-car units.[3] The remaining ten, No. 144014-023 are all 3-car units,[3] although all were originally built as 2-car units, the centre vehicle being added later. These ten Pacers are the only Pacers to contain intermediate vehicles.

Units are formed of two driving motors, one of which contains a toilet. The 3-car units have an additional intermediate motor. All vehicles have standard-class seating only. The technical description of the formation is DMS+(MS)+DMSL. Individual vehicles are numbered as follows.

- 55801-55823 - DMS
- 55850-55859 - MS (units 144014-023 only)
- 55824-55846 - DMSL

Operations [edit]

The class were built specifically for local services sponsored by West Yorkshire PTE (since rebranded as Metro). As such, the fleet was painted in the crimson/cream West Yorkshire Metro livery, although three units (nos. 144011-013) were later repainted into Regional Railways livery. Units are used on services such as:

- Harrogate Line - York-Harrogate-Leeds
- The Wakefield part of the Huddersfield Line - Leeds-Huddersfield
- The Huddersfield branch of the Calder Vale line
- Hallam Line - Leeds-Barnsley-Sheffield
- Penistone Line - Huddersfield-Barnsley-Sheffield
- Pontefract Line - Wakefield-Pontefract
- York & Selby Lines - Leeds/York-Selby/Hull

They can also be found operating the Leeds-Morecambe services, services between Scunthorpe and Adwick to Sheffield and Lincoln and more recently from 2008, between Manchester Victoria and Leeds (usually via Brighouse) amongst others.[*citation needed*] Prior to 1994, they were also used on Leeds/Bradford-Ilkley and Leeds/Bradford-Skipton services. These lines were electrified in 1994, and passenger services were operated by Class 308 electrical multiple units. Due to the their similarities, services booked for a Class 144 can often be replaced by a Class 142, and vice versa.[*citation needed*]

Since privatisation, the fleet has been operated by several franchises. The first operator was Northern Spirit, which was later taken over by Arriva Trains Northern who refurbished the fleet between 2002 and 2004,[*citation needed*] with units emerging in a new silver and red Metro livery complete with refurbished interior. In December 2004, the fleet was transferred to the new Northern Rail franchise. Northern Rail has started to replace the silver and red Metro livery with Northern Purple and Blue. During 2009, 144001-013 were all repainted. As of April 2010, all Class 144s have been repainted.[3]

Northern Rail have commenced a refurbishment programme to their fleet of Class 144 trains. 144006 is the first one to be so treated and this

was also the first one to be refurbished in the joint Arriva Trains Northern/WYPTE Metro programme eight years ago in 2002.

The refurbishment features the following enhancements:[5][6]

- Installation of 'easy to mop' flooring
- The bike area at one end has been extended by removing the bulkhead wall and extending the perch seat from three to four
- Repainted hand grips and stanchlions
- New dado side panels and repainted wall ends
- Retrimmed seats in the purple Northern Rail moquette
- Repainted ceiling
- Repainted driving cab

Fleet details

[edit]

Class	Operator	No. Built	Year Built	Cars per Set	Unit nos.
Class 144	Northern Rail	23	1986–1987	2	144001 - 144013[3]
				3	144014 - 144023[3]

Gallery

[edit]

Arriva Trains Northern/WYPTE Metro refurbished Class 144 Pacer No. 144017 at York, with a service bound for Leeds, via the Harrogate Line

A pair of Northern Rail/WYPTE Class 144 Pacers No. 144005 and 144015 at Leeds

The interior of a Northern Rail/WYPTE Metro Class 144 Pacer DMSO vehicle

Northern Rail/WYPTE Metro Class 144 Pacer No. 144012 at Leeds, with a service bound for Morecambe

Northern Rail/WYPTE Metro Class 144 Pacer No. 144020 at Leeds

The interior of a Northern Rail/WYPTE Metro Class 144 MSO centre vehicle

References

[edit]

1. ^ *Diesel Multiple Units 2010*. Platform 5. 2010. p. 15. ISBN 978-1-902336-75-6.
2. ^ "System Data for Mechanical and Electrical Coupling of Rail Vehicles". Rail Safety and Standards Board. Retrieved 2009-01-05.[*dead link*]
3. ^ *a b c d e f g* "The Junction Fleet List". Retrieved 2010-04-19.
4. ^ http://www.gmita.gov.uk/download/3203/item_08_response_to_the_rail_franchising_consultation
5. ^ "Interior of refurbished Class 144 No. 144006". Retrieved 2010-04-26.
6. ^ "Interior of refurbished Class 144 No. 144006". Retrieved 2010-04-26.

Wikimedia Commons has media related to: ***British Rail Class 144***

V · T · E **British Rail diesel Pacers** [show]

V · T · E **Diesel multiple units of the United Kingdom** [show]

Categories: British Rail diesel multiple units | BREL products

This page was last modified on 25 May 2012 at 04:26.

Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. See Terms of use for details.
Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.

Contact us

Privacy policy About Wikipedia Disclaimers Mobile view